Economics 414
Game Theory

Professor Daniel R. Vincent
Spring 2003

Outline

- Introduction
- Syllabus
- Examples
About Me: Daniel R. Vincent

- B.A. History, University of Toronto
- M.A. Philosophy, Politics and Economics, Oxford University
- Ph.D. Economics, Princeton University
- Assistant Professor, Northwestern University, 1987-95
- Associate Professor, University of Western Ontario, 1995-1998
- Associate Professor, University of Maryland, 1998-
- Principal, Market Design Inc., since 1995
- Visiting Scholar, U.S. Dept of Justice, Antitrust Division.

Course Objectives

- To understand the importance of competitive and cooperative factors in a variety of decision problems
- To learn how to structure and analyze these problems from a quantitative perspective
Course Outline

- Extensive-Form Games
- Strategic-Form Games
- Repeated Games
- Bayesian Games and Bayesian Equilibrium
- Dynamic Games of Incomplete Information
- Bargaining Theory
- Auction Theory (and Practice)

Logistics

- Meet Tuesday and Thursday, 9:30-10:45
- Problem Sets (about 5) [10% of grade. Two PS will be graded.]
  - Must be own work; don’t look at past solutions
  - Small discussion groups fine
- 1 Midterm test -- March 20 [30% of grade.]
- Final Exam [60% of grade]
- Office Hours: Thurs 3:30 pm to 4:45 pm
  - 301.405.3485 or dvincent@wam.umd.edu
First Assignment

Due as soon as you decide to take class (before February 8, 2000).
If I do not receive this, you will not be considered as enrolled in the course.

First Assignment

Send me an email:
Subject: Econ 414
Body:
1. Daniel R. Vincent [name you would like me to use]
2. dvincent@wam.umd.edu [preferred email]
3. 301.405.3485 [preferred phone]
4. Economics [major]
5. Senior [class]
6. If you wish, a private 4 digit number which I will use to post grades during the course.
Readings

- Web site: www.wam.umd.edu/dvincent

Introduction and Examples
Definition

*Game theory* is the study of mathematical models of conflict and cooperation between *intelligent* and *rational* decision makers.

- **Rational**: each individual maximizes her expected utility
- **Intelligent**: individual understands situation, including fact that others are intelligent rational decision makers

Game 1

- Each of three players simultaneously picks a number from \([0,1]\)
- A dollar goes to the player whose number is closest to the average of the three numbers
- In case of ties, the dollar is split equally
**Game 1 in Normal Form (Strategic Form)**

- player $i \in N = \{1, \ldots, n\}$
- strategy $s_i \in S_i$
- strategy vector (profile) $s = (s_1, \ldots, s_n) \in S = S_1 \times \cdots \times S_n$
- payoff function $u_i(s) : S \to \mathbb{R}$, which maps strategies into real numbers
- game in normal form $\Gamma = \{S_1, \ldots, S_n; u_1, \ldots, u_n\}$

**Game 2: Both Pay Auction**

- $4$ is auctioned to highest of two bidders
- Players alternate bidding.
- At each stage, bidding player must decide either to raise bid by $1$ or to quit.
- Game ends when one of the two bidders quits in which case the other bidder gets the $2$, and both bidders pay the auctioneer their bids or when a player bids $4$. That player wins. Again, both players pay their bids.
Game 2 in Extensive Form
(Game Tree)

Game 3
Game 4: “Matching Pennies”

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<td>Tails</td>
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You

Me

Game 4

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Game 5

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1: 0  3  -1  2
2: 2  1  -1  0

Game 3: Backward Induction
Looking ahead and reasoning back

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1: 0  3  -1  2
2: 2  1  -1  0